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(71) Applicant *(for all designated States except US)*: MICRO COMPONENTS LTD. [IL/IL]; D.N., 20179 Misgav (IL).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: NEFTIN, Shimon [IL/IL]; Eshkol Street 813/20, 10200 Kiryat Shmona (IL). MIRSKY, Uri [IL/IL]; Hagalil Street 13, 36001 Nofit (IL).

(74) Agent: REINHOLD COHN AND PARTNERS; P.O. Box 4060, 61040 Tel Aviv (IL).

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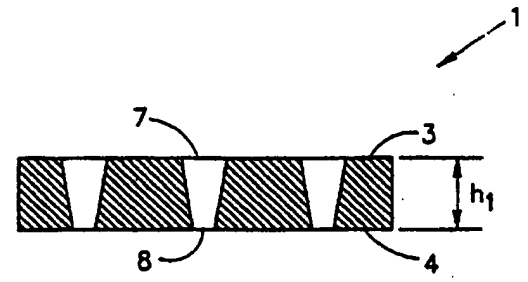
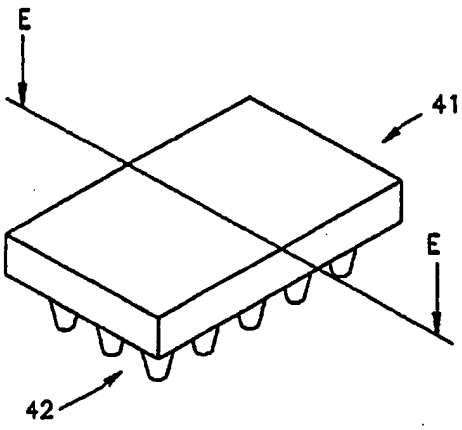
(57) Abstract

A substrate (1, 16, 21, 31) for electronic packaging, the substrate having a discrete, generally prismatoid, initially electrically conductive valve metal solid body with one or more spaced apart, original valve metal filled vias (6, 19, 28, 32) each individually electrically isolated by a porous oxidized body portion therearound. A pin jig fixture (41) for mechanically masking a metal surface, the pin jig fixture (41) having an anodization resistant bed of pins (42) each pin (43) having a leading end surface (44) for intimate juxtaposition against a metal surface to masks portions thereof.





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AMENDED CLAIMS

[received by the International Bureau on 10 December 1998 (10.12.98);
original claims 1-17 replaced by new claims 1-24 (5 pages)]

1. A substrate comprising a discrete, non-layered, solid body having a pair of opposing generally parallel major surfaces, said solid body having a body portion of a porous valve metal oxide based material with a pair of exterior surfaces respectively constituting portions of said major surfaces and extending inward from one of said major surfaces towards the other of said major surfaces, said body portion having one or more electrically insulated original valve metal conductive traces embedded therein, one or more of said traces having a trace portion divergingly extending inward from an exterior surface constituting a portion of one of said major surfaces to the other of said major surfaces.

2. A substrate according to claim 1 wherein said one or more original valve metal conductive traces extend substantially perpendicularly between said major surfaces thereby constituting one or more filled vias.

3. A substrate according to claim 2 wherein a filled via has a diverging cross section area therealong and a thickness between said major surfaces from about 25μm to about 150μm.

4. A substrate according to claim 2 wherein a filled via has a barrel shaped cross section area therealong and a thickness between said major surfaces of less than about 300μm.

5. A substrate according to any one of claims 1 to 4 wherein said solid body has one or more recesses in one of said major surfaces inwardly extending toward the other of said major surfaces thereby forming a

corresponding number of thin portions, at least one of said thin portions constituting a trace portion of a conductive trace.

6. A substrate according to claim 5 wherein non-recessed portions have a thickness between said major surfaces from about 200 μm to about 10 mm.

7. A substrate according to claim 5 wherein a recess has a frusto-conical shape.

8. A substrate comprising a discrete, non-layered, solid body having a pair of generally parallel major surfaces and one or more electrically insulated original valve metal conductive traces embedded in porous valve metal oxide based material, the substrate being formed by a process of porous anodization of a selectively masked original valve metal solid blank for converting non-masked portions of said blank into porous valve metal oxide and thereby retaining masked portions of said blank as said one or more electrically insulated original valve metal conductive traces.

9. A substrate according to claim 8 wherein said one or more original valve metal conductive traces extend substantially perpendicularly between said major surfaces thereby constituting one or more filled vias.

10. A substrate according to claim 9 wherein a filled via has a diverging cross section area therealong and a thickness between said major surfaces from about 25μm to about 150μm.

11. A substrate according to claim 9 wherein a filled via has a barrel shaped cross section area therealong and a thickness between said major surfaces of less than about 300μm.

12. A substrate according to any one of claims 8 to 11 wherein said solid body has one or more recesses in one of said major surfaces inwardly extending toward the other of said major surfaces thereby forming a corresponding number of thin portions, at least one of said thin portions constituting a trace portion of a conductive trace.

13. A substrate according to claim 12 wherein non-recessed portions have a thickness between said major surfaces from about 200 μm to about 10 mm.

14. A substrate according to claim 12 wherein a recess has a frusto-conical shape.

15. A process for manufacturing a substrate having a desired product specification, the process comprising the steps of:

(a) providing a discrete valve metal solid blank having a pair of opposing generally parallel major surfaces;

(b) selectively masking at least one of the major surfaces of the blank in accordance with the desired product specification; and

(c) porously anodizing the selectively masked blank for converting non-masked portions into porous valve metal oxide and thereby retaining masked portions as one or more electrically insulated original valve metal conductive traces embedded in a non-layered porous valve metal oxide based material solid body.

16. A process according to claim 15 wherein the conductive traces extend substantially perpendicularly between the major surfaces thereby constituting one or more filled vias.

17. A process according to claim 16 wherein the blank undergoes one-sided porous anodization thereby limiting a via to a thickness between said major surfaces of about 150 μm.

18. A process according to claim 16 wherein the blank undergoes two-sided porous anodization thereby limiting a via to a thickness of less than about 300 μm.

19. A pin jig fixture for mechanically masking a metal surface, the pin jig fixture being connected to an electrical power source and comprising a bed of pins each having a leading end surface for intimate juxtaposition against the metal surface for masking a corresponding area thereof, one or more of said leading end surfaces being directly connected to the electrical power source for electrically connecting the electrical power source to the metal surface on intimate juxtaposition thereagainst.

20. A pin jig fixture according to claim 19 wherein said bed of pins is formed from an electrically conductive metal based material.

21. A pin jig fixture according to claim 20 wherein said bed of nails is formed from an anodization resistant valve metal based material.

22. A pin jig fixture according to any one of claims 19-21 wherein the leading end surfaces of said bed of pins are substantially co-planar.

23. A pin jig fixture according to any one of claims 19-22 wherein said pins are of two or more different lengths.

24. A process for preparing a selectively masked valve metal surface, the process comprising the steps of:

(a) providing a pin jig fixture according to any one of claims 19-23;

(b) intimately juxtaposing the leading end surfaces of the bed of pins against a valve metal surface;

(c) electrically connecting the pin jig fixture to an electrical power source; and

(d) porously anodizing the valve metal surface.